The role of multinational and trading enterprises in employment and the gender pay gap: evidence from Finland[+]

Henri Luomaranta[#], Fernando Cantu[*], Steve MacFeely[♦] and Anu Peltola[•]

This paper constructs and analyses a set of novel indicators on gender equality in the business sector, which focus on multinational enterprises and foreign traders in Finland. The descriptive analysis reveals large differences in the share of women and men employed in the best paying professions, especially in multinationals. Dynamic analysis shows that foreign investment typically results in pay increases for males, while this is not true for women. These disparities are strongest among managers and professionals working in the most profitable firms. A blueprint is provided for linking business statistics and social statistics to enable analyses of gender inequalities in the labour market.

Keywords: FDI, gender equality, international trade, MNE, official statistics

[+] Received: 28 April 2020 – Revised: 31 August 2020 – Accepted: 5 October 2020.
The authors wish to thank Statistics Finland and Pontus Lindroos for invaluable help with the data and acknowledge the work of Nordic statistical offices in multiple microdata linking projects, and Lennart Stenberg for suggesting a way to define deep digital competences (DDC).

[#] Corresponding author. Henri Luomaranta (henri.luomaranta@unctad.org) is with the Development Statistics and Information Branch, Division on Globalization and Development Strategies, United Nations Conference on Trade and Development (UNCTAD), Geneva, Switzerland.

[*] Fernando Cantu is at the Statistics Division, Department of Policy Research and Statistics, United Nations Industrial Development Organization (UNIDO), Vienna, Austria.

[♦] Steve MacFeely is at the Development Statistics and Information Branch, Division on Globalization and Development Strategies, United Nations Conference on Trade and Development (UNCTAD), Geneva, Switzerland, and with the Centre for Policy Studies, University College Cork, Cork, Ireland.

[•] Anu Peltola is with the Development Statistics and Information Branch, Division on Globalization and Development Strategies, United Nations Conference on Trade and Development (UNCTAD), Geneva, Switzerland.

1. Introduction

How is gender equality achieved in the business sector? Answering this question is perhaps one of the most fundamental tasks in the effort of moving towards women's economic empowerment and the global development agenda, including the Addis Ababa Action Agenda and the 2030 Agenda for Sustainable Development. Studies have shown that economic empowerment is one of the most important explanatory drivers of gender equality more broadly (Barnat et al., 2019).

A key challenge to confront in trying to answer this question is overcoming a paucity of data. Despite growing availability of gender disaggregated data, the link between gender outcomes and the wealth generating apparatus of global economies, i.e. multinational enterprises and international trade, has not been addressed to date.

Multinational enterprises (MNEs), and business groups in general, are important actors in modern economies. From a welfare point of view, and depending on circumstances, they can be seen as either "parasites", or "paragons" (see Khanna and Yafeh, 2007). Carney et al. (2017) in their meta-analysis of business group literature highlight that further research is needed to settle this question. They note that addressing this issue is not straightforward and will depend on context and circumstance. In a similar fashion, expansion of international trade can bring mixed effects from a welfare point of view (e.g. Bourguignon, 2015); very little data exist to facilitate a systematic analysis of labour market outcomes from a gender perspective.

This paper provides a blueprint, showing how business statistics and social statistics can be linked to enable an analysis of gender inequalities in the labour market using data provided by the business sector. In doing so, a number of implications for developing countries, aiming to modernize their statistical systems to improve the availability of data for Sustainable Development Goal (SDG) indicators are highlighted. First, the paper puts emphasis on linking data across existing data sources, better use of government data for statistics, and the development of data architecture that can respond to the challenges of measuring the SDG agenda. As highlighted in MacFeely and Barnat (2017), investments in similar national statistical systems should be a priority to reap long-term benefits in developing regions. Second, the analyses underline the fact that business economies and policies promoting growth cannot be analysed in isolation but, rather, a holistic view is needed to assess their impact on society as a whole. Third, the process of globalization cannot be well understood without properly identifying its most important drivers – multinational and trading enterprises – and without considering its social and human effects.

Analysis of Finnish data reveals that, while a sizeable gender pay[1] gap in the business sector is identified, and in MNEs in particular, the gap is relatively small in domestically-owned businesses. The gender pay gap tends to be larger in high-paying jobs in foreign multinationals. There are exceptions of course; for example, professions requiring deep digital skills generally award more equal pay. In general, however, the analysis suggests that economic globalization tends to magnify gender inequalities in the Finnish labour market. This is further illustrated by focusing on worker level outcomes following foreign investment, which seem to boost men's salaries especially, resulting in wider pay gaps within MNEs.

Section 2 outlines the theoretical basis of gender inequality in the business sector. Section 3 discusses the data sources, definitions and methodologies used, including indicators to measure gender equality in business and trade. Section 4 presents some descriptive statistics and analysis of gender inequalities in MNEs, and Section 5 discusses the robustness of the interpretation and presents tests to assess the evolution of the gender pay gap that results from foreign investment. Section 6 concludes and reflects on possible steps forward.

2. What do we know already?

Economic growth, propelled forward by internationalization, affects gender equality in many ways through labour markets and investment, but the reverse may also be true, as existing gender biases can affect economic growth (e.g. Fontana, 2014). Cross-country comparisons typically find that economic growth benefits from greater gender equality (Dollar and Gatti, 1999; Klasen and Lamanna, 2009), although businesses sometimes extract a comparative advantage from paying women lower wages (Busse and Spielmann, 2005). The picture is further complicated by international trade that reflects the different roles and comparative advantages of countries in the global economy. Regardless, it is commonly accepted that international trade has an important impact on development (see Monterrey Consensus (United Nations, 2012)). However, depending on a variety of circumstances, trade creates winners and losers (e.g. Stiglitz, 2002; Sachs, 2005; Piketty, 2014; Bourguignon, 2015).

Most of the known gender-related outcomes of trade are the difference in how women and men participate in the labour force, which is heterogeneous across countries. In Organisation for Economic Co-operation and Development (OECD) countries, men work more often in exporting firms and women in suppliers of those firms (OECD, 2018), whereas a recent study shows that in developing countries

[1] In this article, pay is measured as the sum of wages and salaries.

women make up a higher share of the workforce in trading firms than in non-trading firms (World Bank, 2020).[2]

Occupational choices of women and men play a key role also in the Finnish gender pay gap, as highlighted in Korkeamäki and Kyyrä (2006) and Ilmakunnas and Maliranta (2005). Foreign trade seems to have lower representation of women than men. Lindroos, Luomaranta and Nurmi (2019) find that 18 per cent of entrepreneurs in exporting firms in Finland were women, and on a full-time equivalent basis, women accounted for 27 per cent of the labour input to exporting firms.

Using data from the United States, Goldin (2014) provides a tentative explanation as to why gender pay gaps still exist in developed countries, arguing that it is because organizations place a high value on worker flexibility in occupations with high-skill requirements. Bøler et al. (2018) show that this reasoning also applies to trading enterprises in Norway, and Vahter and Masso (2018) shows that it applies to Estonian-based MNEs. These findings add to an accumulating literature that suggests that firm heterogeneity plays an important role in the gender pay gap (Card et al., 2016; Cardoso et al., 2016; Jewell et al., 2019; Gallen et al., 2019).

This paper addresses some of the measurement challenges of gender-in-trade by providing a methodology for compiling statistics that builds on statistical registers and other data typically available from national statistical offices. These data allow for systematic inspection of labour participation and pay of both women and men in heterogeneous firms. Moreover, this paper provides additional evidence of the existing gender pay gaps and mechanisms analysed in Vahter and Masso (2018) and Bøler et al., (2018). Data for Finland is of particular interest due to the exceptional coverage offered by registers, and the emphasis the country places on gender equality, allowing for a focus on business and labour market dynamics. Thus, unobserved legal or cultural gender biases are less likely to impede the analysis.

MNE spillovers and measurement issues in developing countries

Anticipating that the methodology used in this paper may serve as a useful blueprint for developing countries, this section considers foreign investment and measurement issues relevant to developing economies. The role of MNEs in development has been much debated, as they may benefit host countries in terms of productivity or by filling institutional voids, yet they may exploit host country resources or exercise monopolistic power. These possibilities seem more consequential for developing

[2] In this text, trading firms refer to those firms that are engaged in cross border (international) trade. For the analysis that follows, an exact definition is provided in Section 3.2.

countries with vulnerable business sectors and weaker institutions. Caves (1999) finds that while productivity spillovers from foreign subsidiaries to local firms are widespread, the impact is conditional on the country's state of development, the firms' market structure and the industry.

An empirical analysis for a sample of developing and developed countries from 1987 to 2007 suggests that stronger economic and social rights for women can spill over into a country with weaker rights when the two countries are connected via trade or foreign direct investment (FDI) (Neumayer and De Soysa, 2011). Similarly, Wang (2018) shows that between 1999 and 2009 governments tended to promote gender parity by employing policy choices similar to those of their economic competitors. As noted by UNCTAD (2020), there are multiple, often country and location-specific interactions between gender and trade requiring case-by-case evaluation: Differences in the labour market structure, economic conditions, degrees of trade liberalization and gender inequality, legal frameworks and commitments as well as the level of women's participation in the economy mean that a successful policy in one country does not necessarily work in another. And this is exactly why the more systematic availability of data is important.

Currently, statistical authorities lack the data and tools to measure gender dynamics in trade, which hampers informed policymaking. The development of registers and the use of government administrative data for statistics can play an important role in the statistical development of developing countries. Without good data infrastructure for national statistics, solid legislation and institutional foundations, countries will not be able to meet existing and future demands for information (MacFeely and Dunne, 2014). The importance of data infrastructure, for the development of national statistical systems and for addressing statistical analyses required by development economics has been highlighted by MacFeely and Barnat (2017); UNCTAD (2016); and UNESCAP (2019). This applies to the SDG monitoring framework in general, but also to gender-in-trade statistics and other emerging data needs.

Even if data gaps exist, extant labour statistics offer a useful point of departure for gender-in-trade analysis in both developed and developing countries, by either focusing on tradable industries or by identifying the firms behind international trade, an approach promoted in this paper. In addition, surveys carried out by international organizations, such as the World Bank Enterprise Surveys[3], provide a valuable complementary data source. Additional country-level surveys may address the most pressing data gaps, such as those relating to the informal economy. To this end, the statistical offices of Rwanda and Uganda, for example,

[3] https://www.enterprisesurveys.org/

record small-scale cross-border trade by sending enumerators to the border areas. The African Trade Policy Centre (ATPC) of the United Nations Economic Commission for Africa has developed a methodology for measuring informal cross-border trade and is piloting it with several African countries. The country-level survey designs may benefit from the insights and definitions outlined in the following sections.

In the vein of leveraging scarce resources, many developing countries will require capacity-building support to achieve data infrastructure that facilitates microdata linking, in which existing data are combined and reused for other data needs. New statistics are needed, especially to gain insights into inequalities in the context of the 2030 Agenda, as well as to inform policymakers in a timely fashion of emerging topics, such as the impact of COVID-19. The following section details the necessary ingredients for the compilation of gender-in-trade statistics.

3. From data sources to indicators

The analysis presented in this paper draws on the register-based statistical infrastructure at Statistics Finland to analyse gender equality in the Finnish business sector. The key element for linking data is the *unique business identifier* that allows consistent identification of an enterprise across different data sources and through time. The business identifier is given by the tax administration and can be used by the enterprise for all administrative purposes.

In Finland, the total known business population and all the ownership links are covered, facilitating comparisons between MNEs and domestic enterprises without requiring any imputation or complex weighting strategies.

The approach used in this paper builds on related initiatives by Eurostat (2019) as well as the OECD work on trade in goods statistics by enterprise characteristics (TEC). Both of these initiatives bridge business statistics and international trade statistics, which serve as a foundation for adding information on business ownership dependencies and gender composition.

3.1 Statistical data sources

The following official statistical surveys and registers provide useful data for the analysis of gender-in-trade:

- The statistical business register (SBR) contains a limited number of key variables for the full population of enterprises, including size and ownership links.

- Structural business statistics (SBS) describe the structure, activity and competitiveness of businesses[4] and includes variables pertaining to the economic performance and productivity of businesses, their inputs and outputs.
- Foreign affiliate statistics (FATS), contain both inward FATS and outward FATS. Inward FATS describe the ownership of an enterprise, i.e. whether an enterprise is foreign-owned or not; the ultimate controlling institutional unit (UCI) defines the country of ownership. Outward FATS detail the geographic distribution of domestically-controlled affiliates abroad. In Finland, these statistics are based on full enumeration of all known legal units with foreign affiliates.
- International trade in goods statistics (ITGS) record physical movement of goods between countries. The administrative records may be collected by the customs including information on foreign trade for amounts above certain thresholds. For Finland, all extra-EU trade is covered, while for trade within the European Union (EU) the limit is €600,000 for both imports and exports in 2020[5]. For this reason, additional information is obtained from the value-added tax (VAT) data to identify traders. These data are available from the tax administration containing total sales from enterprises that can be allocated to trade in goods or services if the trading partner is located within EU.
- International trade in services (ITS) statistics are based on a survey of around 2,000 enterprises, and thus do not provide full coverage of the business sector. However, since the concentration of business activities is very high in Finland, Statistics Finland is able to capture around 80 per cent of turnover from trade in services from the survey. In addition, the VAT data can again be used to identify intra-EU service trade, thus capturing some, if not all, of the small firms that are engaged in services trade.
- Combined employer-employee data (FOLK) link employees and employers, similarly as the increasingly available linked employer-employee data (LEED) (e.g. Hammermesh, 2007). The data include information on individual characteristics, such as family, living arrangements, employment relationships, income and educational attainment.

[4] Covering sectors from B to J and L to N and Division 95 of the Statistical Classification of Economic Activities in the European Community, referred to as NACE (nomenclature statistique des activités économiques dans la Communauté européenne). It is the industry classification system used in the European Union, equivalent to the UN International Standard Industrial Classification of All Economic Activities (ISIC).

[5] https://tulli.fi/en/intrastat/who-provides-intrastat-information.

3.2 Definitions and analytical groupings

The following analytical groupings are useful for measuring and understanding the different roles enterprises may have in creating gender-related outcomes in the labour market. The firm-type definitions proposed below, follow broadly the guidelines published by Eurostat (2019) for microdata linking.

Domestic enterprises	
Independent	Does not control any other enterprise or is not controlled[6] by another enterprise.
Domestic group	Controlled by a domestic group, or a domestic parent without affiliates abroad.
Multinational enterprises[7]	
Domestic MNE	Controlled by a domestic group, or is a domestic parent with foreign affiliates in OFATS.
Foreign MNE	Controlled by a foreign group, and therefore found in IFATS.
Trading status	
Exports only	Exports exceeding €5,000 and export intensity above 5 per cent.
Imports only	Imports exceeding €5,000 and import intensity above 5 per cent.
Two-way traders	Enterprise satisfies thresholds for both exporter and importer.
Non traders	Enterprise does not belong to the above categories.
Skills and occupations	
STEM	Science, technology, engineering, and mathematics.[8]
DDC	Subset of STEM, fields requiring deep digital competencies.[9]
ISCO-major groups	The International Standard Classification of Occupations (ISCO) major groups (1-digit level).
Activity distribution	
KIS	Eurostat definition, knowledge-intensive services.[10]
Manufacturing	NACE 2-digit categories 10-33.
Other	

[6] Based on direct or indirect share of votes, exceeding 50 per cent.

[7] Analysis of MNEs is partial, as only domestic activities are observed. However, the problem is circumvented by focusing on comparable analytical units, i.e. enterprises and their dependencies.

[8] These span the International Standard Classification of Education Fields of education and training (ISCED-F) codes: 511, 512, 531, 532, 533, 541, 542, 612, 613, 711, 712, 713, 714, 715, 716, 721, 722, 723, 724, 731, 732.

[9] ISCED-F codes: 533, 541, 542, 612, 613, 711, 713, 714.

[10] https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Knowledge-intensive_services_(KIS).

High-skill categories are relevant for studying differential gender-based outcomes. In addition, employees with science, technology, engineering and mathematics (STEM) education are expected to benefit from globalization and international trade, owing to an increased skills premium (e.g. Burstein et al., 2011). It is in these categories that the gender pay gap is found to be large (see Kahn and Kinther, 2017, for a review of this literature).

In addition, the new wave of globalization is driven by digitalization and computer competences. Hence, the relevance of deep digital competences (DDC), a category that delineates those equipped with "deeper" digital skills from standard STEM-equipped employees. Michaels, Natraj and Van Reenen (2014) find indeed that job polarization is related to information and communication technology (ICT) development. The knowledge-intensive services (KIS) category is similarly of relevance.

Other analytical possibilities include splitting manufacturing industries by technological requirements (e.g. high-technology and low-technology), or one could examine even more disaggregated statistics. The categories selected for this analysis are based on an ex ante understanding of gender inequality in the context of globalization.

Based on the analytical groupings presented above, *participation rates* and *average pay* of women and men are contrasted. In this way, the role of firm types in both occupational choices of women and men and gender pay gap is assessed.

4. Gender equality in the Finnish business sector

4.1 The Finnish business sector in numbers. Where are the "best" jobs?

The Finnish economy is characterized as industrialized and open. The business sector employs around 74 per cent of the workforce, according to the latest employment statistics (Statistics Finland, 2019). Due to the small size of the domestic economy, export markets are an important driver of growth and development. However, the adverse effects of international competition in the largest multinational enterprises (Fornaro & Luomaranta, 2018) have also been felt. Job losses in the aftermath of difficulties in the mobile phone industry serve as a reminder of the risks arising from depending on a few multinationals.[11]

[11] MacFeely (2012) in the context of Ireland's economy has also highlighted the risks of depending on large MNEs, highlighting that although MNEs only account for 2 per cent of enterprises, they account for 22 per cent of persons engaged and half of all gross value added generated by enterprises. The largest 50 MNEs present an even greater risk, accounting for 30 per cent of total enterprise turnover, 37 per cent of GVA and 59 per cent of gross operating surplus.

Table 1 presents an overview of the Finnish business population providing a backdrop for the subsequent analysis. This section focuses on cross sectional differences where the statistics presented are aggregated averages for the years 2008 to 2016. Enterprises with only one employee (often the entrepreneur) are excluded. Exclusion of one-person companies is driven by data quality considerations, as it is much harder to determine the level of what the wages and salaries in those enterprises is (the entrepreneur may for instance pay dividends or accrue retained earnings). Furthermore, only full-time employees are included, since the inclusion of part-time workers hampers the comparison between women and men as women are more likely to be employed on a part-time basis.

Table 1. The Finnish business sector by firm type, 2008-2016, average

	(1)	(2)
Firm type	**Observations[1]**	**Per cent**
Multinational enterprises		
MNEs	22,870	4
Others	521,667	96
Trading status		
Exports only	14,684	3
Imports only	86,039	16
Two-way traders	32,834	6
Non traders	410,980	75
Size distribution[2]		
Large (>250 FTE)	4,864	1
Medium (50-250 FTE)	19,785	4
Small (10-50 FTE)	10,9397	20
Micro (<10 FTE)	410,491	75
Activity distribution		
Manufacturing	85,622	16
Construction	88,836	16
Trade	131,727	24
Services	238,352	44

Source: Authors› calculations based on data extracted from Statistics Finland.
Notes:
[1] Observations refer to firms observed over 2008–2016.
[2] FTE refers to Full Time Equivalent.

Columns 1 and 2 of table 1 present the composition of the Finnish business sector. Multinationals account for a tiny fraction of enterprises (4 per cent). Trade participation is rare, as 76 per cent of enterprises are non-traders. Large firms represent less than one per cent of the enterprise population. Also, a large portion of firms are located in the services sectors (almost 44 per cent).

Table 2 highlights the types of enterprises by dependency and ownership and considers their productivity.

Table 2: An overview of the business sector broken down by the enterprise relation 2008-2016, average

	(1)	(2)	(3)	(4)
Size, productivity and salaries	**Size by employees**	**Labour productivity (Value Added/ worker)**	**Female salary (€)**	**Male salary, (€)**
Independent	8	60,188	25,732	31,219
Domestic group	67	93,269	33,275	43,365
Domestic MNE	**234**	96,071	**41,526**	**59,079**
Foreign MNE	89	**115,130**	41,499	58,292
NACE category	**Manufacturing**	**Construction**	**Trade**	**Services**
Independent	14%	**18%**	24%	**44%**
Domestic group	28%	9%	19%	45%
Domestic MNE	**45%**	4%	19%	31%
Foreign MNE	21%	3%	**42%**	34%
Trading status	**Exports**	**Imports**	**Two-way trader**	**Non-trader**
Independent	2%	15%	4%	**79%**
Domestic group	5%	17%	14%	64%
Domestic MNE	**8%**	15%	**45%**	32%
Foreign MNE	5%	**39%**	32%	24%
Skills	**% of professionals**	**% STEM**	**% DDC**	
Independent	11%	33%	7%	
Domestic group	14%	34%	9%	
Domestic MNE	18%	34%	8%	
Foreign MNE	**20%**	**39%**	**12%**	
Gender differences	**Female participation rate**	**Premia**	**Women/Male salary**	
Independent	33%	-2.7 %	**82%**	
Domestic group	**39%**	1.5 %	77%	
Domestic MNE	37%	1.4 %	70%	
Foreign MNE	36%	**0.0 %**	71%	
Average	36%			

Source: Authors' calculations based on data extracted from Statistics Finland.
Note: Premia are computed as deviation from the business sector participation rate, share of professionals refers to ISCO-2 category of workers. Percentages under the NACE category and trading status sections are computed from the number of firms, while percentages in skills and gender differences sections are computed from workers.

In the first section of table 2, column 2 shows that foreign-owned multinational enterprises are almost twice as productive as independent enterprises; productivity of domestically-owned MNEs are not far behind foreign MNEs. In columns 3 and 4, average annual salaries reflect this productivity gap. Foreign MNEs pay on average €58,292 to male workers (column 3), while female employees receive €41,499 (column 4). These salaries are broadly similar to those paid by domestic MNEs. Thus, MNEs pay a premium in excess of 30 per cent compared with average salaries in the non-MNE business sector. Foreign-owned multinationals are most often situated in trade[12] (42 per cent), and services (34 per cent) while domestic MNEs are mostly found in manufacturing (45 per cent).

The section on skills presented in table 2 shows that higher pay is associated with higher-skilled workforce, as on average, 20 per cent of MNE employees are defined as *professionals* by the ISCO classification. In addition, almost 40 per cent of their workforce have received a STEM education and 12 per cent have received a DDC education. This contrasts with independent enterprises, where only 11 per cent of employees are professionals, 33 per cent have a STEM degree, and 7 per cent have a DDC degree.

4.2 Multinationals and gender inequality

Female participation in the business sector averages around 36 per cent (gender section of table 2), as women are more often employed in the public sector. Women represented 72 per cent of public sector workers in 2018 (Statistics Finland, 2020a). In addition, women's unemployment rate (6.2 per cent) is lower than men's (7.5 per cent) (Statistics Finland, 2020b).

The simple descriptive statistics 3a and 3c in the final section of table 2 reveal firm heterogeneities from a gender perspective. While independent enterprises have a slightly lower female participation rate than the average of 36 per cent (-2.7 percentage points lower), domestic groups and domestic MNEs have a higher female participation rate than the average (about 1.5 percentage points higher).

MNEs, as seen in table 2, provide highly productive employment[13] and tend to pay the highest salaries. Table 3 provides further insights into gender roles in the Finnish labour market.

[12] Including wholesale and retail trade.

[13] MacFeely and O'Brien (2008) warn that care should be exercised when drawing conclusions from productivity estimates, as differences between MNEs and independent enterprises may in some cases be an accounting one, as the financial accounts for foreign owned enterprises can be distorted by the impact of outsourcing, transfer pricing, merchanting, licensing or royalty arrangements etc.

Table 3a. Pay and participation rates of women in manufacturing by enterprise relation and job category, 2008–2016, average

	(1)	(2)	(3)	(4)
	Manufacturing			
Enterprise relation	Independent	Domestic group	Domestic MNE	Foreign MNE
TOTAL				
Labour productivity (VA/worker)	**58,122**	74,593	**93,021**	90,096
Women's salary (€)	**26,237**	32,679	**40,395**	39,040
Men's salary (€)	**31,438**	40,528	**56,936**	50,466
Women's/Men's salary	**83.5%**	80.6 %	**70.9%**	77.4%
% of female	**24%**	26%	**31%**	25%
STEM				
Women's salary (€)	**26,439**	32,890	**45,313**	39,554
Men's salary (€)	**32,441**	40,773	**61,826**	53,554
Women's/Men's salary	**82%**	80.7%	**73.3%**	73.9%
% of female	**10%**	11%	**16%**	11%
DDC				
Women's salary (€)	**31,470**	35,736	41,960	**44,024**
Men's salary (€)	**34,633**	40,017	**53,806**	50,155
Women's/Men's salary	**90.9%**	89.3%	**78.0%**	87.8%
% of female	**4%**	5%	**7%**	6%
ISCO-1				
Women's salary (€)	**42,489**	73,613	**104,909**	86,094
Men's salary (€)	**52,019**	86,159	**131,408**	109,291
Women's/Men's salary	**81.7%**	85.4%	79.8%	78.8%
% of female	16%	**15%**	**22%**	17%
ISCO-2				
Women's salary (€)	**37,175**	44,965	51,810	**51,906**
Men's salary (€)	**42,571**	51,548	**61,770**	60,820
Women's/Men's salary	87%	**87.2%**	**83.9%**	85.3%
% of female	**20%**	21%	**32%**	23%
ISCO-3				
Women's salary (€)	**31,532**	35,729	38,480	**38,674**
Men's salary (€)	**37,412**	43,387	47,417	**49,294**
Women's/Men's salary	**84.3%**	82.3%	81.2%	**78.5%**
% of female	**32%**	34%	**42%**	33%

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Table 3a. Pay and participation rates of women in manufacturing by enterprise relation and job category, 2008–2016, average *(concluded)*

	(1)	(2)	(3)	(4)
	Manufacturing			
Enterprise relation	Independent	Domestic group	Domestic MNE	Foreign MNE
ISCO-4				
Women's salary, €	**27,808**	30,941	32,938	**33,609**
Men's salary, €	**32,251**	36,232	**40,655**	39,993
Women's/Men's salary	**86.2%**	85.4%	**81.0%**	84.0%
% of female	**80%**	77%	**74%**	75%
ISCO-5				
Women's salary, €	**22,126**	27,971	28,373	**30,577**
Men's salary, €	**29,786**	35,393	37,529	**38,409**
Women's/Men's salary	**74.3%**	79.0%	75.6%	**79.6%**
% of female	**68%**	66%	64%	**51%**
ISCO-6				
Women's salary, €	**17,644**	22,524	**24,164**	20,305
Men's salary, €	**22,642**	26,562	**35,711**	32,708
Women's/Men's salary	77.9%	**84.8%**	67.7%	**62.1%**
% of female	26%	**43%**	**9%**	16%
ISCO-7				
Women's salary, €	**23,244**	27,374	28,440	**30,047**
Men's salary, €	**28,830**	33,648	35,162	**36,688**
Women's/Men's salary	**80.6%**	81.4%	80.9%	**81.9%**
% of female	11%	**12%**	11%	**10%**
ISCO-8				
Women's salary, €	**22,456**	27,401	29,007	**31,186**
Men's salary, €	**27,583**	32,405	34,196	**37,222**
Women's/Men's salary	**81.4%**	84.6%	**84.8%**	83.8%
% of female	29%	**31%**	26%	**26%**
ISCO-9				
Women's salary, €	**19,241**	24,911	26,629	**28,194**
Men's salary, €	**25,635**	30,294	31,760	**33,541**
Women's/Men's salary	**75.1%**	82.2%	83.8%	**84.1%**
% of female	**38%**	33%	31%	**24%**

Source: Authors' calculations based on data extracted from Statistics Finland.
Note: The smallest and largest values of each row are in bold.
ISCO-1 categories - 1 Managers - 2 Professionals - 3 Technicians and associate professionals 4 Clerical support workers - 5 Service and sales workers - 6 Skilled agricultural, forestry and fishery workers - 7 Craft and related trades workers - 8 Plant and machine operators, and assemblers - 9 Elementary occupations.

Table 3b. Pay and participation rates of women in knowledge intensive services (KIS) by enterprise relation and job category, 2008–2016, average

	(1)	(2)	(3)	(4)
		KIS		
Enterprise relation	Independent	Domestic group	Domestic MNE	Foreign MNE
TOTAL				
Labour productivity (VA/worker)	66,735	71,837	**51,921**	107,083
Women's salary, €	31,288	38,273	44,542	**44,839**
Men's salary, €	40,753	52,148	63,386	**64,145**
Women's/Men's salary	76.8%	73.4%	70.3%	69.9%
% of female	39%	37%	35%	32%
STEM				
Women's salary, €	**36,050**	41,351	47,356	**51,167**
Men's salary, €	**44,211**	55,036	70,811	**73,721**
Women's/Men's salary	**81.5**%	75.1%	**66.9**%	69.4%
% of female	19%	18%	**19%**	**17%**
DDC				
Women's salary, €	**42,381**	44,356	53,192	**58,147**
Men's salary, €	**46,114**	54,156	64,643	**75,921**
Women's/Men's salary	**91.9%**	81.9%	82.3%	**76.6%**
% of female	**8%**	10%	8%	**10%**
ISCO-1				
Women's salary, €	**54,172**	74,894	96,149	**96,643**
Men's salary, €	63,230	87,906	126,472	121,552
Women's/Men's salary	**85.7%**	85.2%	**76.0%**	79.5%
% of female	**21%**	23%	**25%**	22%
ISCO-2				
Women's salary, €	36,832	43,405	48,129	51,958
Men's salary, €	43,670	53,107	65,530	**67,560**
Women's/Men's salary	84.3%	81.7%	**73.4%**	76.9%
% of female	29%	**30%**	28%	**28%**
ISCO-3				
Women's salary, €	**29,891**	35,248	38,795	**40,883**
Men's salary, €	**35,144**	43,039	45,961	**53,187**
Women's/Men's salary	**85.1%**	81.9%	84.4%	**76.9%**
% of female	**55%**	**42%**	41%	33%

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Table 3b. Pay and participation rates of women in knowledge intensive services (KIS) by enterprise relation and job category, 2008–2016, average *(concluded)*

	(1)	(2)	(3)	(4)
			KIS	
Enterprise relation	Independent	Domestic group	Domestic MNE	Foreign MNE
ISCO-4				
Women's salary, €	**25,152**	29,655	32,196	**32,644**
Men's salary, €	**26,510**	32,465	33,364	**38,701**
Women's/Men's salary	**94.9%**	91.3%	**96.5%**	84.3%
% of female	**71%**	**81%**	76%	77%
ISCO-5				
Women's salary, €	**20,831**	25,309	25,564	**26,328**
Men's salary, €	**26,073**	29,195	33,173	**33,227**
Women's/Men's salary	79.9%	**86.7%**	**77.1%**	79.2%
% of female	**60%**	69%	**73%**	66%
ISCO-6				
Women's salary, €	22,537	**30,928**	**10,165**	17,006
Men's salary, €	21,500	**27,905**	**19,971**	22,325
Women's/Men's salary	104.8%	**110.8%**	**50.9%**	76.2%
% of female	58%	36%	**25%**	**71%**
ISCO-7				
Women's salary, €	**25,248**	31,013	30,335	**31,589**
Men's salary, €	**29,892**	36,290	37,577	38,205
Women's/Men's salary	84.5%	**85.5%**	**80.7%**	82.7%
% of female	**10%**	10%	**21%**	14%
ISCO-8				
Women's salary, €	**21,405**	26,767	**31,507**	29,983
Men's salary, €	27,616	30,253	30,432	**32,784**
Women's/Men's salary	**77.5%**	88.5%	**103.5%**	91.5%
% of female	**25%**	40%	**55%**	47%
ISCO-9				
Women's salary, €	**15,790**	**19,416**	17,849	17,983
Men's salary, €	22,297	24,888	**21,876**	**26,755**
Women's/Men's salary	70.8%	78.0%	**81.6%**	**67.2%**
% of female	46%	**36%**	**48%**	**38%**

Source: Authors' calculations based on data extracted from Statistics Finland.
Note: The smallest and largest values of each row are in bold.
ISCO-1 categories - 1 Managers - 2 Professionals - 3 Technicians and associate professionals
4 Clerical support workers - 5 Service and sales workers - 6 Skilled agricultural, forestry and fishery workers - 7 Craft and related trades workers - 8 Plant and machine operators, and assemblers - 9 Elementary occupations.

Table 3c. Pay and participation rates of women in other activities by enterprise relation and job category, 2008–2016, average

	(1)	(2)	(3)	(4)
		Other activities		
Enterprise relation	Independent	Domestic group	Domestic MNE	Foreign MNE
TOTAL				
Labour productivity (VA/worker)	**59,300**	105,806	121,377	**125,255**
Women's salary, €	**24,328**	32,138	41,401	**41,428**
Men's salary, €	**29,386**	42,208	**59,493**	59,229
Women's/Men's salary	**82.8%**	76.1%	70%	**69.9 %**
% of female	**35%**	**45%**	44.8%	44%
STEM				
Women's salary, €	**24,568**	32,264	**44,439**	42,137
Men's salary, €	**30,894**	42,802	**67,461**	61,158
Women's/Men's salary	79.5%	**75.4%**	**66%**	68.9%
% of female	**8%**	12%	**14%**	12%
DDC				
Women's salary, €	**27,233**	35,144	**50,760**	42,657
Men's salary, €	**32,846**	42,682	56,368	**57,369**
Women's/Men's salary	82.9%	82.3%	**90%**	**74.4%**
% of female	**2%**	4%	**6.4%**	4%
ISCO-1				
Women's salary, €	**34,366**	70,151	**94,159**	87,842
Men's salary, €	**44,387**	86,652	**135,350**	113,107
Women's/Men's salary	77.4%	81.0%	**70%**	77.7%
% of female	**24%**	25%	**25.4%**	24%
ISCO-2				
Women's salary, €	**35,807**	43,057	52,490	**53,834**
Men's salary, €	**40,205**	51,529	62,100	**64,257**
Women's/Men's salary	**89.1%**	**83.6%**	85%	83.8%
% of female	39%	38%	**43.0%**	**38%**
ISCO-3				
Women's salary, €	**30,352**	35,911	40,282	**43,643**
Men's salary, €	**36,786**	46,513	53,938	**58,455**
Women's/Men's salary	**82.5%**	77.2%	75%	**74.7%**
% of female	43%	40%	**43.7%**	**39%**

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Table 3c. Pay and participation rates of women in other activities by enterprise relation and job category, 2008–2016, average *(concluded)*

	(1)	(2)	(3)	(4)
		Other activities		
Enterprise relation	Independent	Domestic group	Domestic MNE	Foreign MNE
ISCO-4				
Women's salary, €	**26,530**	29,882	33,360	**34,281**
Men's salary, €	30,605	34,966	**40,792**	40,165
Women's/Men's salary	**86.7**%	85.5%	**82**%	85.3%
% of female	**71%**	60%	**57%**	70%
ISCO-5				
Women's salary, €	**20,502**	25,628	**30,857**	30,835
Men's salary, €	**25,096**	32,630	40,041	**41,737**
Women's/Men's salary	**81.7**%	78.5%	77%	**73.9**%
% of female	61%	**72%**	64.9%	**60%**
ISCO-6				
Women's salary, €	**18,278**	18,516	**23,448**	20,128
Men's salary, €	**23,627**	25,548	**26,660**	24,072
Women's/Men's salary	77.4%	**72.5**%	**88**%	83.6%
% of female	50%	46%	**40%**	**61%**
ISCO-7				
Women's salary, €	**22,534**	26,521	29,445	**30,089**
Men's salary, €	**28,850**	34,273	36,908	**38,587**
Women's/Men's salary	78.1%	**77.4**%	**80**%	78.0%
% of female	5%	5%	**6.7%**	**5%**
ISCO-8				
Women's salary, €	**21,964**	27,177	**30,512**	29,447
Men's salary, €	**27,172**	33,920	35,794	**36,103**
Women's/Men's salary	80.8%	**80.1**%	**85**%	81.6%
% of female	7%	8%	**5%**	**9%**
ISCO-9				
Women's salary, €	17,558	20,938	24,430	23,155
Men's salary, €	24,120	27,804	30,051	30,155
Women's/Men's salary	72.8%	75.3%	81%	76.8%
% of female	45%	43%	51%	**51%**

Source: Authors' calculations based on data extracted from Statistics Finland.
Note: The smallest and largest values of each row are in bold.
ISCO-1 categories - 1 Managers - 2 Professionals - 3 Technicians and associate professionals
4 Clerical support workers - 5 Service and sales workers - 6 Skilled agricultural, forestry and fishery workers - 7 Craft and related trades workers - 8 Plant and machine operators, and assemblers - 9 Elementary occupations.

Column 1 of the first section of Table 3 shows that in the manufacturing sector, women's salaries are only 84 per cent of men's salaries in independent firms, 71 per cent in domestically-owned MNEs (column 2), 77 per cent in foreign-owned MNEs (column 4) active in Finland and 81 per cent in domestic enterprise groups (column 3). The data on KIS in table 3b shows that in that sector women's salaries are 77 per cent of men's salaries in independent firms (column 1), 73 per cent in domestic groups (column 2) and 70 per cent in domestic and foreign MNEs (columns 3 and 14).

The gender pay gap is larger in MNEs than in other businesses (columns 3 and 4 of tables 3a to 3c). However, both genders receive a significant boost in salaries when employed by MNEs. Women working in foreign-owned multinationals earn on average salaries that are almost 50 per cent higher, while men's salaries are 60 per cent higher, compared with independent enterprises in the manufacturing sector. The largest gender pay gap is found in foreign-owned businesses in the KIS sector, the group of businesses that pays the highest salaries.

Focusing more closely on MNEs, the share of women workers is higher in other activities (table 3c) than KIS (table 3b) and manufacturing (table 3c). In KIS, only 32 per cent of the employees in foreign MNEs are women (column 4 of table 3b), and slightly higher, 35 per cent, in domestic MNEs (column 3 of table 3b). Interestingly, in column 2 of table 3b, the share of women in KIS increases to 37 per cent in domestic enterprise groups (non-MNEs) and to 39 per cent in independent enterprises (column 1 of table 3b). This observation is consistent with the pattern where men account for the bulk of higher paying jobs, and the share of women increases as average pay decreases.

The section on STEM in tables 3a to 3c, reveals that women are underrepresented across the board in these jobs, although slightly less so in MNEs. The gender pay differences in STEM jobs are larger in multinationals.

Professions requiring deep digital competence are clearly dominated by men as seen in tables 3a to 3c. Women represent only around 10 per cent of workers in all DDC jobs in the KIS sector (table 3b) and even less in other industries. This is noteworthy, as these professions are expected to benefit the most from digitalization. Perhaps surprisingly, the gender pay gap is quite small for those who have the DDC education in manufacturing jobs (table 3a) and the KIS sector (table 3b) in independent firms. In these occupations, women earn around 90 per cent of their male counterparts' salaries in independent businesses, on the other hand, in the best paying firm category – foreign MNEs – women's salaries comprise 88 per cent of their male counterparts in manufacturing, and 77 per cent in KIS (column 4 of tables 3a and 3b).

In the section on ISCO-1, tables 3a to 3c show that women are poorly represented in managerial level occupations (ISCO-1) across the board. This category includes workers who command the highest pay. In MNEs, some 20 per cent of managers are women. Women are slightly more likely to be managers in domestic MNEs (column 3) than in foreign MNEs (columns 4). In foreign MNEs active in KIS, 22 per

cent of managers are women, compared with 25 per cent in domestic MNEs in the same sector (columns 3 and 4 of table 3b). In manufacturing (table 3a), women managers are rarer: between 15 and 16 per cent of managers in non-MNEs (columns 1 and 2), 22 per cent in domestic MNEs (column 3) and 17 per cent in foreign MNEs (column 4). The gender pay gap is still very large for business managers overall and tends to be larger in multinationals.

Another interesting category from a "quality-job" perspective, is the ISCO-2 category in tables 3a to 3c, which includes professionals with relatively complex job descriptions. There too, women have low participation as professionals in manufacturing (table 3a) and KIS (table 3b). On the other hand, the other activities category (table 3c) has a high representation of women. Looking at MNEs in the KIS sector, in both for eign and domestic firms, the share of women professionals is 28 per cent (table 3b). The gender pay gap is relatively small in this category overall, but wider for MNEs. For example, in foreign MNEs that are active in KIS, women's salaries are around 77 per cent of men's salaries (column 4 of table 3b), while for independent KIS enterprises the relative salary is about 84 per cent (column 1 of table 3a). Out of the ISCO-2 categories, women tend to have the highest salaries in MNEs active in other sectors than KIS or manufacturing (in columns 3 and 4 of table 3c).

The gender pay gap is noticeable among clerical support workers (ISCO-4) too, where women form the majority of the workforce and salary levels are relatively low. In these occupations, the gender pay gap tends to be lowest in KIS, where women earn 95 per cent of men's salaries in independent businesses (column 1 of table 3a), 91 per cent in domestic enterprise groups (column 2 of table 3b), 97 per cent in domestic MNEs (column 3 of table 3b) and 84 per cent in foreign MNEs (column 4 of table 3b).

Men dominate the best paying jobs in the business sector, while women account for the majority of support functions. MNEs provide jobs that pay well but widen the gender pay gap. While smaller independent businesses are more gender equal in terms of pay in white-collar occupations (ISCO-1 to ISCO-5), they generally pay lower salaries. However, this observation is not universal across occupations, as those working in jobs requiring deep digital skills enjoy more equal pay. This highlights the importance of high-level education and the importance of encouraging women to enter these fields.

4.3 Traders and gender equality

Trade participation is a significant driver of economic development and welfare. The statistics presented in table 4 provide evidence that indeed both female and male workers employed in trading enterprises enjoy higher salaries. Below, unless otherwise specified, the text refers to columns 3 and 4 that present statistics on two-way traders and non-traders, respectively.

Table 4. Pay and participation rates of women by trading status, 2008–2016, average

	(1) Exports only	(2) Imports only	(3) Two-way trader	(4) Non-trader
TOTAL				
Labour productivity (VA/worker)	68,842	69,255	**80,516**	**62,830**
Women's salary, €	32,838	29,318	**35,078**	**25,931**
Men's salary, €	40,588	37,407	**45,416**	**31,370**
Women's/Men's salary	81%	78%	**77%**	**83%**
% of female	**25%**	38%	30%	**39%**
STEM				
Women's salary, €	35,306	31,080	**37,099**	**27,881**
Men's salary, €	41,115	39,146	**47,392**	**32,944**
Women's/Men's salary	**86%**	79%	**78%**	85%
% of female	**8%**	13%	13%	10%
DDC				
Women's salary, €	41,242	39,474	**42,825**	**33,862**
Men's salary, €	44,131	41,736	**47,763**	**35,515**
Women's/Men's salary	93%	95%	**90%**	**95%**
% of female	**4%**	5%	**6%**	4%
ISCO-1				
Women's salary, €	64,648	58,061	**77,161**	**41,481**
Men's salary, €	71,506	68,355	**88,744**	**51,329**
Women's/Men's salary	**90%**	85%	87%	**81%**
% of female	**16%**	21%	19%	**24%**
ISCO-2				
Women's salary, €	42,798	42,850	**46,951**	**37,849**
Men's salary, €	49,497	48,942	**53,558**	**43,841**
Women's/Men's salary	86%	88%	**88%**	**86%**
% of female	27%	33%	**26%**	**33%**
ISCO-3				
Women's salary, €	34,989	34,460	**37,326**	**30,965**
Men's salary, €	42,670	42,606	**46,877**	**37,234**
Women's/Men's salary	82%	81%	**80%**	**83%**
% of female	**36%**	37%	36%	**46%**

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Table 4. Pay and participation rates of women by trading status, 2008–2016, average *(concluded)*

	(1) Exports only	(2) Imports only	(3) Two-way trader	(4) Non-trader
ISCO-4				
Women's salary, €	29,430	29,598	**31,837**	**26,597**
Men's salary, €	34,899	34,660	**37,414**	**30,019**
Women's/Men's salary	**84%**	85%	85%	**89%**
% of female	**55%**	**71%**	66%	67%
ISCO-5				
Women's salary, €	26,861	22,824	**28,479**	**20,680**
Men's salary, €	33,829	30,183	**36,358**	**25,116**
Women's/Men's salary	79%	**76%**	78%	**82%**
% of female	**53%**	63%	**66%**	65%
ISCO-6				
Women's salary, €	20,461	20,650	**21,178**	**18,116**
Men's salary, €	25,221	26,379	**27,570**	**23,181**
Women's/Men's salary	**81%**	78%	**77%**	78%
% of female	29%	**52%**	**24%**	47%
ISCO-7				
Women's salary, €	25,312	24,490	**27,323**	**23,230**
Men's salary, €	30,710	31,092	**33,555**	**29,047**
Women's/Men's salary	**82%**	**79%**	81%	80%
% of female	7%	10%	**10%**	**7%**
ISCO-8				
Women's salary, €	24,961	24,419	**27,544**	**22,239**
Men's salary, €	30,246	29,613	**32,466**	**27,406**
Women's/Men's salary	83%	82%	**85%**	**81%**
% of female	16%	22%	**28%**	**11%**
ISCO-9				
Women's salary, €	21,361	20,255	**25,130**	**17,705**
Men's salary, €	28,696	27,071	**30,103**	**24,123**
Women's/Men's salary	74%	75%	**83%**	**73%**
% of female	**26%**	35%	29%	**52%**

Source: Authors' calculations based on data extracted from Statistics Finland.
Note: The smallest and largest values of each row are in bold.
ISCO-1 categories - 1 Managers - 2 Professionals - 3 Technicians and associate professionals
4 Clerical support workers - 5 Service and sales workers - 6 Skilled agricultural, forestry and fishery workers - 7 Craft and related trades workers - 8 Plant and machine operators, and assemblers - 9 Elementary occupations

In traders, labour productivity is higher, for instance in two-way trader enterprises – approximately 28 per cent higher (the first section of table 4) than in non-trading enterprises. In two-way traders, women's salary is 35 per cent higher than in non-traders, and men's salary 40 per cent higher. The pay ratio is 6 percentage points wider for employees in two-way traders than in non-traders; Female salaries are 77 per cent of men's salaries in two-way traders and 83 per cent in non-traders. STEM and DDC workers receive sizeable trade premiums in salaries which are larger for men.

However, the share of women is very low in these professions. In managerial positions, trading firms seem to provide more equal pay than non-traders, but women's participation rates are lower among traders. Among professionals, the gender pay gap is lowest overall, and slightly lower still in two-way traders compared with other firms. Thus, drawing conclusions about the gender pay gap is not straightforward. The main channel by which gendered outcomes are generated by trade stems from the number of positions held by women among the highly paid and thus, their participation in trade. Overall, the share of women employed by two-way traders is lower than the share of men. In non-traders, women workers make up 39 per cent of the workforce, compared with 30 per cent in two-way traders.

In summary, the highest-paying occupations are usually occupied by men and this is even more so in the case of trade, but the conclusions on the gender pay gap are mixed. Highly-skilled professions, for instance, have smaller pay gaps in two-way traders than in non-traders. Still, on balance, the gender pay gap is larger in two-way traders compared with non-traders, stemming from the distribution of high-paying jobs within those firms.

5. Robustness and statistical inference

This section confirms the robustness of our conclusions when confronted with alternative definitions and classic statistical inference.

First, multivariate regression analyses were performed at the firm-level to test statistical significance of the differences in women's and men's pay between independent and domestic groups and multinational enterprises broken down by country of origin of the enterprise.

In particular, the following regression is estimated:

$$y_{i,t}=\alpha + \beta T_{i,t}+X_{i,t}\,\gamma+ \mu_t+\varepsilon_{i,t} \quad (1)$$

In (1), $y_{i,t}$ represents women's / men's salaries in firm *i,* in year *t.* $T_{i,t}$ represents a set of indicator variables for each of the enterprise relationship grouping of interest (independent, domestic group, domestically-owned MNE; Nordic, EU26, Asian,

Table 5. MNEs and salary differences between women and men in occupations, regression coefficients

	women's/men's salary										
	STEM	DDC	ISCO-1	ISCO-2	ISCO-3	ISCO-4	ISCO-5	ISCO-6	ISCO-7	ISCO-8	ISCO-9
Domestic group	-0.0710***	-0.0556***	-0.112***	-0.0617***	-0.134***	-0.146***	-0.200***	-0.0408	**-0.0544*** **	-0.0916***	-0.125***
	(-8.951)	(-3.387)	(-9.660)	(-9.619)	(-18.71)	(-7.345)	(-8.546)	(-0.341)	(-6.889)	(-7.398)	(-7.116)
Domestic MNE	-0.0805***	-0.0436	-0.152***	-0.0534***	**-0.112*** **	-0.178***	-0.130**	-0.0182	-0.0306	-0.0970***	-0.118***
	(-4.050)	(-1.514)	(-7.766)	(-4.711)	(-9.832)	(-6.850)	(-2.186)	(-0.0818)	(-1.282)	(-4.271)	(-4.474)
Nordic	-0.0894***	-0.0793***	-0.129***	-0.0477***	-0.159***	**-0.144*** **	**-0.162** **	0.393	**-0.0594*** **	-0.0998***	-0.113***
	(-6.181)	(-3.264)	(-7.370)	(-4.307)	(-14.72)	(-4.864)	(-2.230)	(1.275)	(-3.394)	(-6.024)	(-3.817)
EU26	-0.0899***	-0.0128	-0.127***	**-0.0397*** **	-0.146***	-0.151***	-0.262***	0.452	-0.0119	-0.0828***	-0.108***
	(-6.883)	(-0.418)	(-7.476)	(-3.408)	(-13.88)	(-5.386)	(-4.038)	(0.420)	(-0.588)	(-4.759)	(-4.165)
Asia	-0.0735***	-0.00760	-0.125***	**-0.0767*** **	**-0.168*** **	**-0.207*** **	**-0.272*** **	…	-0.0301	-0.0799*	-0.139***
	(-2.780)	(-0.165)	(-4.260)	(-4.030)	(-9.089)	(-5.234)	(-3.488)	…	(-1.230)	(-1.742)	(-2.938)
Latin America-Africa	**-0.177** **	**-0.109** **	**-0.169*** **	0.0425	-0.153***	1.133	…	…	0.0133	**-0.0735* **	**-0.309*** **
	(-2.161)	(-2.483)	(-2.646)	(0.715)	(-2.952)	(1.381)	…	…	(0.169)	(-1.840)	(-4.497)
North America	**-0.0548*** **	-0.0387	-0.127***	-0.0678***	-0.163***	-0.146***	-0.201***	…	-0.0582***	**-0.117*** **	**-0.107*** **
	(-2.785)	(-1.303)	(-5.982)	(-4.722)	(-12.40)	(-3.595)	(-2.696)	…	(-2.876)	(-4.253)	(-3.327)
Observations	60,886	11,089	41,621	53,788	70,434	26,390	62,673	543	33,682	35,456	21,712
R-squared	0.023	0.045	0.021	0.017	0.038	0.066	0.008	0.258	0.015	0.013	0.035
Clusters	14,580	2,653	13,094	19,121	8,110	17,695	234	234	10,838	10,425	7,409

Source: Authors' estimations based on data extracted from Statistics Finland.

Note: β coefficients from (1). The regressions include full specifications as explained in (1) and the error terms are clustered around firm identity. The coefficients are interpreted as differences from the independent category. The negative coefficient values indicate smaller salaries for women with respect to men. Clusters refer to the number of firms in the regression. The smallest and largest values of each column are shown in bold. The t-statistics are presented in brackets.

Robust t-statistic in parenthesis;***, ** and * denotes significance at 1%, 5% and 10% level, respectively.

Latin American or African and North American MNEs). $T_{i,t}$ is 1 if a firm belongs to the group of interest, and 0 otherwise. Therefore, β allows inference on the effect on the salary ratio by firm type.

$X_{i,t}$ is a set of firm controls, which include 2-digit NACE indicators, number of employees, labour productivity, trade openness (exports+imports)/(turnover+purchases), and indicators for each trade participation category (exporter, importer, and two-way trader). μ_t is year fixed effects, and $\varepsilon_{i,t}$ is clustered errors around firm identifier.

Table 5 provides the β coefficients which represent the relative differences to independent firms. (1) is estimated for each job category.

The coefficients in STEM and ISCO-1 populations indicate that the gender pay gap is largest in Latin-American/African enterprises active in Finland. In the ISCO-2 to ISCO-5 jobs, the largest gender pay gap appears in Asian MNEs. Altogether, the results in table 5 establish that the differences between the independent category and the rest of the enterprise types are statistically significant across job categories in terms of pay inequality while controlling for firm observables.

Second, a more convincing interpretation of MNEs' effect on the gender pay gap can be obtained by inspecting worker level outcomes, made possible by the linked employer-employee data set. The Blinder-Oaxaca (BO) decomposition (Blinder, 1973; Oaxaca, 1973), divides the pay gap into "explained" and "unexplained" parts and is a popular method for studying labour market outcomes as it assesses how much of the outcome variable differential stems from different characteristics of the group members. The reliability of the decomposition method hinges on the ability to model the determinants of pay. For this reason, a rich set of both firm and worker characteristics is fed into the model to minimize the problem of omitted variables.

The BO equations incorporate determinants of pay relating to a worker to model expected salaries. This will form the basis for the "explained" part indicating how much the two groups differ. The remainder is the part which the model cannot explain with the observables.

The employed decomposition can be summarized a:

$$R=Q+U \tag{2}$$

$$R=[\mathrm{E}(\mathrm{x_A})-\mathrm{E}(\mathrm{x_B})]'\ \beta^*+[\mathrm{E}(\mathrm{x_A})'\ (\beta_A-\beta^*)+\mathrm{E}(\mathrm{x_B})'(\beta^*-\beta_B)] \tag{3}$$

where the explained part Q is $\mathrm{E}(\mathrm{x_A})-\mathrm{E}(\mathrm{x_B})]'\ \beta^*$, amounting to the fraction of the differences explained by the group differences in the predictors. The remainder of (2) is the unexplained part, i.e. $U= |\mathrm{E}(\mathrm{x_A})'\ (\beta_A-\beta^*)+\mathrm{E}(\mathrm{x_B})'(\beta^*-\beta_B)|$. This amounts to the observed difference from the expected outcomes. As explanatory variables, a set of human resource characteristics is included (education by 2-digit International

Standard Classification of Education, age, age squared, experience, occupation categories by 2-digit ISCO classification), firm characteristics (productivity, average wages[14]) and year dummies. As in Neumark (1988), the coefficients are obtained from a pooled regression over both groups. Table 6 provides the decomposition of pay gap in non-MNE and MNE populations.

Table 6. Blinder-Oaxaca decomposition of pay differential in non-MNEs and MNEs

	(1) non-MNE	(2) MNE
Explained	0.179***	0.132***
	(361.2)	(189.3)
Men	10.46***	10.73***
	(31.6)	(23.1)
Women	10.10***	10.34***
	(21.7)	(14.0)
Difference	0.360***	0.397***
	(630.8)	(454.7)
Unexplained	0.181***	0.265***
	(327.0)	(333.2)
Observations	6,548,888	2,437,545

Source: Authors' estimations based on data extracted from Statistics Finland.
Note: Explanatory variables include age, age^2, tenure, education, occupation, firm employees, firm labour productivity, firm average wage, firm NACE class, years.
Robust z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 6 shows that the unexplained component of MNEs is 0.26 log points (67 per cent of the raw gap) and the unexplained component of non-MNEs is 0.18 log points (50 per cent of the raw gap). These results indicate that the observables included in the model are not able to account for a large share of the pay differential, although a rich set of variables is included. Another important conclusion is that in MNEs this is even less true. This implies that in MNEs, the pay difference that cannot be justified based on the observed worker characteristics is larger, but it is also likely that there are many unobserved factors at play, related to unobservable worker characteristics or to the exact responsibilities within firms, which the registers may not fully capture. The following section presents a tighter identification of MNEs' impact on pay by focusing on worker level outcomes during ownership changes.

[14] Including average pay of the firm may seem odd, but its inclusion accomplishes a higher explained component and a tighter identification of the differences generated by the MNE status. Its exclusion does not alter any conclusions. The purpose here is to demonstrate that whatever the model, MNE population has higher unexplained component and not necessarily interpret the amounts.

Third, we find dynamic analysis useful for understanding the drivers of the observed differences. Similar to Vahter and Masso (2018), a set of worker level pay equations are estimated, controlling for various characteristics of both workers and firms to test whether changes in ownership have measurable and different impacts on women and men. As opposed to Vahter and Masso (2018), a tighter identification is preferred by fixing the worker-firm pairs instead of the firm or worker alone. In this way, one can bypass the endogenous matching issue, a key advantage of using matched employee-employer panel data sets. This specification focuses on incumbents where no entries and exits are allowed. The presented conclusions are not influenced by this choice, however.

The insightful analysis in Bøler et al. (2018) concludes that the number of time zones a firm is engaged in may affect the pay disparity between women and men, supporting the idea that firms have more incentive to disproportionately reward flexibility if firm operations require activity during unusual hours. The following specifications use the number of time zones separating the UCI (ultimate controlling institutional unit) headquarters and Eastern European Time (the Finnish time zone). For Finnish-owned multinationals, the number of time zones separating the furthest affiliate is defined. For domestic firms, the measure is zero.

The specifications rely on within firm-worker deviations from the mean plausibly caused by a change in ownership (a *treatment*). Thus, a causal interpretation is supported if pre-treatment trends do not deviate from 0 *before* the firm is acquired. A typical argument going against causality is the non-random assignment of treated firms. For instance, the firms may be selected precisely because they have some hidden potential affecting future pay. This concern is addressed by estimating the pre-treatment effects, and by propensity score matching, selecting similar firms by the probability of being acquired, to act as a placebo group.

The regressions can be expressed as follows and they are estimated in various subsets of data.

$$y_{i,t} = \alpha_{i,t} + \beta(Treat * Gender) + \delta Treat + \vartheta Gender + \gamma X_{t,i} + \delta W_{t,i} + \mu_t + \epsilon_{i,t} \quad (4)$$

$$y_{i,t} = \alpha_{i,t} + \beta\,(TimeZones * Gender) + \vartheta Gender + \rho TimeZones + \theta UCI_{i,t} + \gamma X_{i,t} + \delta W_{i,t} + \mu_t + \epsilon_{i,t} \quad (5)$$

$$y_{i,t} = \alpha_{i,t} + \sum_{s=1}^{3} \beta_{-s} \mu_{t-s} T_{j,t} + \sum_{s=1}^{3} \beta_{+s}\, \mu_{t+s}\, T + X'_{j,t}\, \gamma + \mu_t + \epsilon_{i,t} \quad (6)$$

Where $y_{i,t}$ denotes annual average pay, *Treat* stands for treatment equalling 1 when a firm is acquired by a multinational (and it remains 1 in the subsequent periods), *UCI* stands for the location of the ultimate controlling unit grouped by geographic area, $y_{i,t}$ collects the firm specific time varying variables, $W_{t,i}$ denotes the worker level variables, μ_t are year dummies and $\alpha_{i,t}$ captures the fixed effects specified as firm-worker pairs. *Gender* is a dummy (males=0), and in (4) *TimeZones* is as

explained above. In both (4) and (5) the variance of interest comes from changes in ownership. Particularly for the latter regression, the variance of interest comes from changes in the number of time zones as a result of ownership changes, i.e. if the headquarters changes location, or the firm acquires affiliates. Thus, β measures the relative impact on women compared to men.

Addressing the concern that the observed pay differentials would have appeared regardless, firm being acquired or not, a counterfactual set of 3 nearest neighbour firms is selected by propensity score matching (measured from pre-treatment data). The placebo group receives a treatment by regressing pay against the pre-treatment and post-treatment dummies exactly as in (6), using the same set of controls. The dummies capture the timing of treatment of the treated firm which would ideally have no effect on the *similar* counterfactual firms. The algorithm uses NACE class, age, labour productivity and size as predictors for being treated. Table 7 below reports the results from (4) and (5).

Across the regressions, MNEs have a different impact on women's pay. In column 1, the MNE status has a negative effect on women's pay when compared to men's pay. Column 2 focuses on the high-skill category, showing a stronger effect than what is found in column 3 for the rest of the occupations. A possible explanation follows from Becker's (1957) theory, which states that more profitable firms can afford to engage in costly taste-based discrimination. Columns 4 to 6 provide some evidence of this point, where labour productivity interacts with gender. Indeed, increased productivity is associated with higher gender pay differential as a result from ownership change. In column 5, this seems to hold especially among skilled workers.

Columns 7 to 9 consider geographical areas of ownership and allow interesting observations to be made. Asian multinationals would seem to be responsible for the highest gender pay disparity, while the gender interactions are smallest for domestic groups. The regressions with time-zone interactions in columns 12 and 13 reveal that overall as an MNE's scope across time zones grows (while controlling for the geographic area too), women benefit more with respect to men in lower-skill positions. This is not the case for the high-skilled (column 12), where women's earnings decline with respect to men's. This finding is similar to Bøler et al. (2018) and supports the insights by Goldin (2014) who notes that it is the high-skilled workers who are expected to be more flexible, and here women seem to be at a larger disadvantage when measured by the gender pay gap.

Fourth, when discussing specifications where the treatment induced difference to some previous state is interpreted, an ideal scenario for causal inference would be to observe non-existing pre-treatment trends. The following plots provide the coefficients from estimating (6) in selected subsets of workers for both women and men.

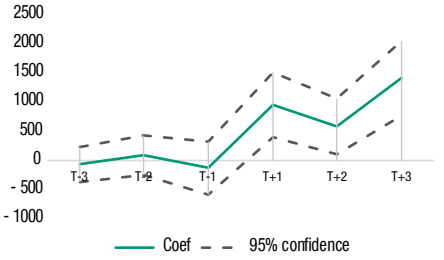
Table 7. Pay equations and interactions with gender

	(1) All	(2) High skill	(3) Lower skill	(4) All	(5) High skill	(6) Lower skill	(7) All	(8) High skill	(9) Lower skill	(11) All	(12) High skill	(13) Lower skill
Dep variable							Salary					
MNE*female	-1,384***	-3,916***	-266.6***									
	(-8.469)	(-6.264)	(-4.622)									
Prod*female				-0.0108***	-0.00429	-0.00540***						
				(-3.219)	(-0.846)	(-4.924)						
MNE*Prod*female				-0.0463***	-0.0745***	0.00179						
				(-3.713)	(-3.900)	(0.967)						
Dom group*female							-183.6**	-413.4	-97.47**			
							(-2.420)	(-1.489)	(-2.206)			
Dom MNE*female							-323.7*	-1,860***	152.1*			
							(-1.816)	(-2.859)	(1.691)			
Nordic*female							-1,378***	-3,164***	-412.8***			
							(-6.392)	(-3.750)	(-4.003)			
EU26*female							-3,295***	-8,030***	-1,047***			
							(-9.625)	(-6.079)	(-10.38)			
Asia*female							-6,531***	-17,029***	149.6			
							(-4.617)	(-4.046)	(0.526)			
Latin Am.-Africa*female							-4,216***	-9,387***	-2,806**			
							(-2.796)	(-2.758)	(-2.329)			
North-America*female							-4,513***	-7,789***	-794.6***			
							(-8.029)	(-5.678)	(-3.790)			
Female*timezones										-106.8***	-404.9***	69.25***
										(-2.924)	(-3.475)	(5.596)
Mean pay	440.88	678.87	369.92	440.88	678.87	369.92	440.88	678.87	369.92	440.88	678.87	369.92
Observations	1,622,321	408,799	1,213,522	1,622,321	408,799	1,213,522	1,622,321	408,799	1,213,522	1,621,073	408,271	1,212,802
R-squared	0.056	0.061	0.140	0.078	0.084	0.142	0.057	0.064	0.141	0.057	0.064	0.141
# Firm-workers	281,710	93,164	230,982	281,710	93,164	230,982	281,710	93,164	230,982	281,703	93,125	230,957

Source: Authors' estimations based on data extracted from Statistics Finland.

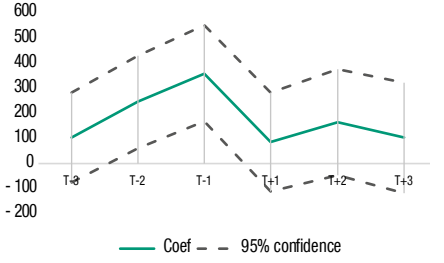
Note: High skills refer to ISCO 1- 2, medium skills to ISCO 3-5, and low skills to ISCO 6-9. The table collects ? coefficients from equations (4) and (5). Controls include age, age2, tenure, education by 3-digits ISCED, occupation by 2-digits ISCO, firm employees, firm labour productivity, firm NACE class by 2-digits, geographical location of UCI, and years. Notice that the sample is restricted to firms which change ownership status during the sample, allowing within firm estimates to be computed.

Figure 1: Parallel trends, men



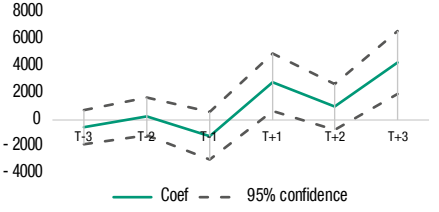
Source: Author's estimations from Statistics Finland database.
Note: T-3/T-1 refer to periods before, and T+1/T+3 refer to periods following the acquisition.

Figure 2: Parallel trends, women



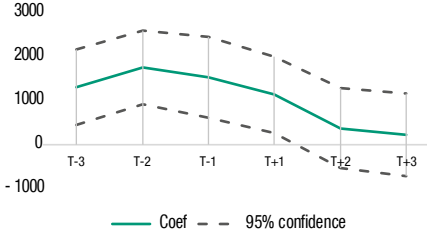
Source: Author's estimations from Statistics Finland database.
Note: T-3/T-1 refer to periods before, and T+1/T+3 refer to periods following the acquisition.

Figure 3: High-skill, men



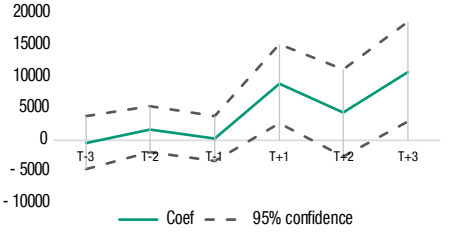
Source: Author's estimations from Statistics Finland database.
Note: T-3/T-1 refer to periods before, and T+1/T+3 refer to periods following the acquisition.

Figure 4, High-skill, women



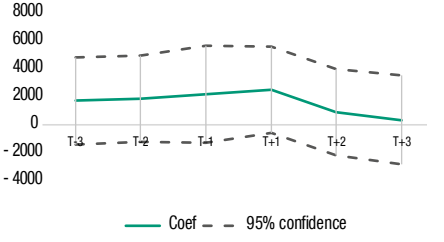
Source: Author's estimations from Statistics Finland database.
Note: T-3/T-1 refer to periods before, and T+1/T+3 refer to periods following the acquisition.

Figure 5: Managers, men



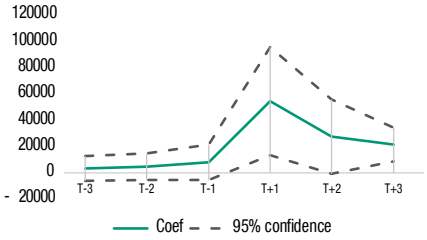
Source: Author's estimations from Statistics Finland database.
Note: T-3/T-1 refer to periods before, and T+1/T+3 refer to periods following the acquisition.

Figure 6: Managers, women



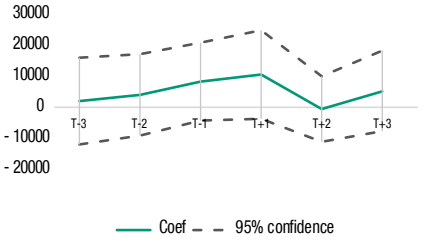
Source: Author's estimations from Statistics Finland database.
Note: T-3/T-1 refer to periods before, and T+1/T+3 refer to periods following the acquisition.

Figure 7: Top managers, men



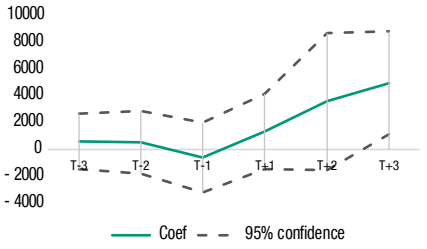
Source: Author's estimations from Statistics Finland database.
Note: T-3/T-1 refer to periods before, and T+1/T+3 refer to periods following the acquisition. Top firms belong to upper quartile of productivity distribution during the period following the acquisition.

Figure 8: Top managers, women



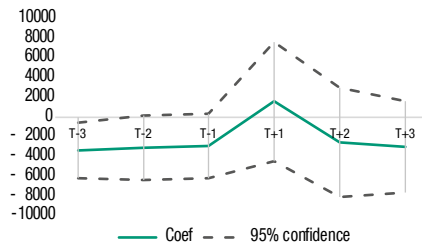
Source: Author's estimations from Statistics Finland database.
Note: T-3/T-1 refer to periods before, and T+1/T+3 refer to periods following the acquisition. Top firms belong to upper quartile of productivity distribution during the period following the acquisition.

Figure 9: Other managers, men



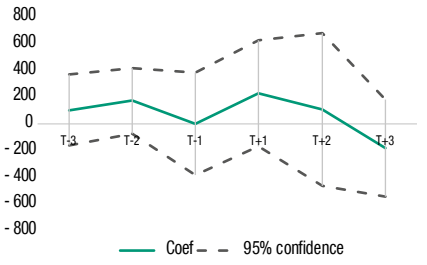
Source: Author's estimations from Statistics Finland database.
Note: T-3/T-1 refer to periods before, and T+1/T+3 refer to periods following the acquisition. Managers in firms that do not belong to the upper quartile of productivity following the acquisition

Figure 10: Other managers, women



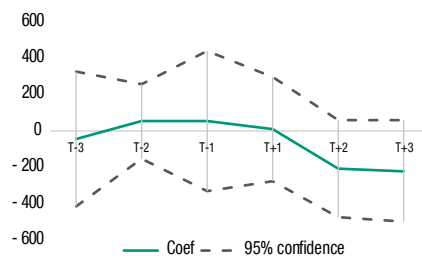
Source: Author's estimations from Statistics Finland database.
Note: T-3/T-1 refer to periods before, and T+1/T+3 refer to periods following the acquisition. Managers in firms that do not belong to the upper quartile of productivity following the acquisition

Figure 11: Placebo 3-nn, men



Source: Author's estimations from Statistics Finland database.
Note: T-3/T-1 refer to periods before, and T+1/T+3 refer to periods following the acquisition.

Figure 12: Placebo 3-nn, women



Source: Author's estimations from Statistics Finland database.
Note: T-3/T-1 refer to periods before, and T+1/T+3 refer to periods following the acquisition.

Figures 1 and 2 provide evidence that men receive a boost in pay as a consequence of their employer firm being acquired by an MNE, while women display no significant differences during T+1 to T+3. If anything, women's pay seems to suffer from significant pre-treatment effects, hampering causal interpretation for women. This points towards a possibility that only men's pay is affected by MNE acquisition. Similar patterns are found for high-skill workers (figures 3 and 4) and for managers (figures 5 and 6).

As a further test for what kind of firms are driving the effects, the sample is divided into four categories based on productivity at T+1. Figures 7 and 8 present results for men and women managers, respectively, showing a significant increase in men's pay and no impact on women's pay. Figures 9 and 10 consider firms that are less productive at T+1, showing no impact on salaries. It appears that among high-skill workers and managers, men reap higher pay as a consequence of success of the firm. Figures 10 and 11 show no significant effects on the control group, addressing the concern that men's pay might be affected by omitted variables.

As a fifth and final set of robustness checks we first note that the decision to exclude part-time workers (14 per cent of workers) leads to smaller gender pay gap estimates. The percentage of women's salaries of men's salaries computed including part-time workers would be 81 per cent in independent enterprises (82 per cent if part-time workers are excluded) and 68 per cent in foreign-owned multinationals (71 per cent if part-time workers are excluded). We also excluded one-person companies. If they were included, the percentage would be 81 in independent enterprises. As mentioned before, these choices were driven by data quality issues to facilitate comparisons. Using medians instead of averages does not alter any of the main conclusions, even if the gender pay gaps would appear smaller that way. Lastly, the group differences between jobs situated in MNEs and in non-MNEs are statistically significant in all occupation groups based on simple t-statistics[15], except for ISCO-6.

6. Conclusions

Using high-quality Finnish registers, covering in principle the entire business sector and linking employees to employers, we build statistics which find large differences in the share of women and men employed in the best paying professions, such as in managerial jobs, and in professions requiring science, technology, engineering or mathematics degrees, or deep digital competencies. In multinationals and foreign traders, women are much less likely to occupy these professions, indicating that

[15] Available upon request.

economic globalization tends to strengthen gender-related labour market outcomes in Finland.

While the share of women professionals working in enterprises engaged in foreign trade is lower, women in these professions experience a smaller gender pay gap compared to businesses that are not involved in foreign trade. For professionals, the gender pay gap is noticeably larger in foreign and domestic MNEs operating in knowledge-intensive services, who pay high salaries.

The country of ownership may play a role. Notably, Latin American, African and Asian-owned MNEs provide the most unequal pay between women and men in high-paying jobs. The regressions exploiting MNE acquisitions provide evidence that a change in MNE ownership increases male salaries but has no effect on women's pay in Finland. Supporting indirect evidence is found for time-use disparity as a possible mechanism, in line with the conclusions from Estonia (Vahter and Masso, 2018) and Norway (Bøler et al.,2018).

Moreover, the disparity in pay seems to be stronger as a function of the profitability of the firm, supporting Becker's (1957) theory of taste-based discrimination. As the analysis pointed out, gender pay gaps widen precisely among the workers most important to any firm, the managers and high-skill workers, suggestions offered in Goldin (2014) seem highly relevant also in Finland. That is, policies and workplace practices aimed at reducing imbalances arising from reproductive roles would help women in high-end careers. Besides addressing the time-use disparities themselves, this may be achieved by developing a business culture that encourages healthy and balanced work and private life. There may be a contrast in this respect between Finnish-owned and foreign-owned firms, as the Finnish culture is one of the most conditioned to the ideas of equality and good work-life balance. This may explain some of the ownership effects found herein, but further research, possibly qualitative, would be necessary to confirm this point.

The primary aim of this paper is to illustrate the types of analyses that can be conducted when datasets can be linked at microdata level. In doing so, encouraging official statisticians to consider the data architecture and infrastructure needed to reuse and link existing microdata, so that they can respond to the need for better information on gender equality in trade and multinationals, not to mention the complex challenges of measuring equality and inclusion posed by the 2030 Agenda. The paper, therefore, demonstrates how a well-rounded statistical infrastructure may be used to create new statistics from existing data so that links between trade, investment and social outcomes can be drawn and gender equality policies better informed.

The challenges are manifold for developing countries where women are most vulnerable and statistical capacities less developed. The analyses in this study rely on being able to link data. A multitude of discrete survey data is no substitute for an efficient national data infrastructure, where public service administrative data

are properly organized, digitized, and use standard classifications and unique identifiers. Developing economies would benefit from investment in statistical and data infrastructure, building on their national capacity and priorities, to measure the impact of multinationals and international trade on inclusive economic development and gender equality.

An interesting line of future research would be to try to disentangle cultural spillovers as an explanation for pay disparity. This would be particularly interesting in the developing country context.

An important future effort should focus on providing similar statistics on gender-in-trade from the data held by statistical offices, and where needed with special surveys addressing national data gaps and challenges, such as informal trade. In that vein, the European Commission is undertaking work with UNCTAD to advance the development and use of data and statistics for gender-responsive trade policy, and similar methodologies and data are being piloted by interested African and Eastern European countries in a programme launched by UNCTAD in 2020 with the Economic Commissions for Africa and Europe.

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